

IN THE CLAIMS

A clean version of the entire set of pending claims as amended by this Response is presented on the following page.

Claims 10, 22, 32, 45-58, 60, 62 and 64 are amended as indicated by a marked up version of the rewritten claims, which follows the Remarks, showing all changes relative to the previous version of the claims.

Clean Version of the Entire Set of Pending Claims

1        1. A DC to DC switching circuit for controlling power  
2        switching devices in a DC to DC converter having first and second  
3        interleaved converter circuits operating into a common load  
4        comprising:  
5            a current sense circuit sensing the voltage across a sense  
6        resistor in series with the power supply supplying power to the  
7        power switching devices;  
8            a first pulse width modulator controlling the power  
9        switching devices of the first converter circuit;  
10          a second pulse width modulator controlling the power  
11        switching devices of the second converter circuit;  
12          a feedback circuit responsive to the voltage across the  
13        common load;  
14          control circuits for controlling the first and second pulse  
15        width modulators responsive to the feedback circuit and a  
16        commanded output voltage;  
17          the control circuits also being responsive to the difference  
18        in the voltage across the sense resistor when the first converter  
19        is drawing power from the power supply through the sense resistor  
20        and the second converter is not, and when the second converter is  
21        drawing power from the power supply through the sense resistor  
22        and the first converter is not, to adjust the relative duty cycle

23 of the first and second converters to tend to minimize the  
24 difference in the voltage across the sense resistor;  
25 the current sense circuit, the first pulse width modulator,  
26 the second pulse width modulator, the feedback circuit and the  
27 control circuits being in a single integrated circuit.

1 2. The DC to DC switching circuit of claim 1 wherein the ✓  
2 sense resistor is external to the integrated circuit.

1 3. (Amended) The DC to DC switching circuit of claim 1  
2 further comprised of an integrator having an output responsive to  
3 the integral of an error signal, the error signal being  
4 responsive to the voltage across the common load and a desired  
5 voltage, the control circuits also being responsive to the output  
6 of the integrator.

1 4. The DC to DC switching circuit of claim 3 wherein the  
2 time constant of the integrator is adjustable by the selection of  
3 at least one component external to the integrated circuit.

1 5. The DC to DC switching circuit of claim 3 further  
2 comprised of a differentiator having an output responsive to the  
3 rate of change of the voltage across the common load, the control  
4 circuits also being responsive to the output of differentiator.

1       6. The DC to DC switching circuit of claim 5 wherein the  
2 time constant of the differentiator is adjustable by the  
3 selection of at least one component external to the integrated  
4 circuit.

1       7. The DC to DC switching circuit of claim 1 wherein the  
2 control circuits are also responsive to rapid decreases in the  
3 voltage on the common load to turn on the first and second  
4 converter circuits independent of the phase of the first and  
5 second pulse width modulators.

1       8. The DC to DC switching circuit of claim 7 wherein the  
2 control circuits are also responsive to rapid increases in the  
3 voltage on the common load to turn off the first and second  
4 converter circuits independent of the phase of the first and  
5 second pulse width modulators.

1       9. The DC to DC switching circuit of claim 1 further  
2 comprised of a load variation circuit coupled to the control  
3 circuits to decrease the voltage on the common load for higher  
4 voltages across the current sense resistor and to increase the  
5 voltage on the common load for lower voltages across the current  
6 sense resistor.

1        10. (Twice Amended) DC to DC switching circuit for  
2 controlling power switching devices in a DC to DC converter  
3 having first and second converter circuits operating into a  
4 common load comprising:

5        a first pulse width modulator controlling the power  
6 switching devices of the first converter circuit;

7        a second pulse width modulator controlling the power  
8 switching devices of the second converter circuit;

9        a feedback circuit responsive to the voltage across the  
10 common load;

11        control circuits for controlling the first and second pulse  
12 width modulators responsive to the feedback circuit, the  
13 operation of the first and second pulse width modulators being  
14 interleaved;

15        the control circuits also being responsive to the difference  
16 in currents through the first converter and the second converter  
17 to adjust the relative duty cycle of the first and second  
18 converters to tend to minimize the difference in the voltage  
19 across a sense resistor;

20        the first pulse width modulator, the second pulse width  
21 modulator, the feedback circuit and the control circuits being in  
22 a single integrated circuit.

1        11. The DC to DC switching circuit of claim 10 wherein the  
2 commanded output voltage is controllable through an input to the  
3 integrated circuit.

1        12. The DC to DC switching circuit of claim 10 wherein the  
2 commanded output voltage is controllable through a digital input  
3 to the integrated circuit.

1        13. (Amended) The DC to DC switching circuit of claim 12  
2 further comprised of an integrator having an output responsive to  
3 the integral of an error signal, the error signal being  
4 responsive to the voltage across the common load and a desired  
5 voltage, the control circuits also being responsive to the output  
6 of the integrator.

1        14. The DC to DC switching circuit of claim 13 wherein the  
2 time constant of the integrator is adjustable by the selection of  
3 at least one component external to the integrated circuit.

1        15. The DC to DC switching circuit of claim 13 further  
2 comprised of a differentiator having an output responsive to the  
3 rate of change of the voltage across the common load, the control  
4 circuits also being responsive to the output of differentiator.

1        16. The DC to DC switching circuit of claim 15 wherein the  
2 time constant of the differentiator is adjustable by the  
3 selection of at least one component external to the integrated  
4 circuit.

1        17. The DC to DC switching circuit of claim 12 wherein the  
2 control circuits are also responsive to rapid decreases in the  
3 voltage on the common load to turn on the first and second  
4 converter circuits independent of the phase of the first and  
5 second pulse width modulators.

1        18. The DC to DC switching circuit of claim 17 wherein the  
2 control circuits are also responsive to rapid increases in the  
3 voltage on the common load to turn off the first and second  
4 converter circuits independent of the phase of the first and  
5 second pulse width modulators.

1        19. The DC to DC switching circuit of claim 12 further  
2 comprised of a load variation circuit coupled to the control  
3 circuits to decrease the voltage on the common load for higher  
4 currents through the converters and to increase the voltage on  
5 the common load for lower currents through the converters.

1        20. The DC to DC switching circuit of claim 12 wherein the  
2 commanded output voltage is controllable through an input to the  
3 integrated circuit.

1        21. The DC to DC switching circuit of claim 12 wherein the  
2 commanded output voltage is controllable through a digital input  
3 to the integrated circuit.

1        22. (Three Times Amended) A DC to DC converter having a  
2 plurality of converter circuits for operating into a common load,  
3 comprising:

4        a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a plurality of pulse width modulators driven by a common  
10 oscillator in an interleaved manner, each pulse width modulator  
11 controlling one of the plurality of buck converter circuits,  
12 whereby the operation of the buck converter circuits is  
13 interleaved;

14        a feedback circuit responsive to a voltage across the common  
15 load;

16        a voltage control circuit controlling the plurality of pulse  
17    width modulators responsive to the feedback circuit and a  
18    commanded output voltage; and

19        a current balance control circuit responsive to the  
20    difference in currents in the plurality of interleaved buck  
21    converter circuits and controlling the pulse width modulators to  
22    balance the currents in the plurality of interleaved buck  
23    converter circuits;

24        the plurality of pulse width modulators and the control  
25    circuits being in a single integrated circuit.

1        24. (Twice Amended) The DC to DC converter of claim 22  
2    further comprised of an integrator having an output responsive to  
3    the integral of an error signal, the error signal being  
4    responsive to the voltage across the common load and a desired  
5    voltage, the control circuits also being responsive to the output  
6    of the integrator.

1        25. (Amended) The DC to DC converter of claim 24 wherein a  
2    time constant of the integrator is adjustable by the selection of  
3    at least one component external to the integrated circuit.

1        26. (Amended) The DC to DC converter of claim 24 further  
2    comprised of a differentiator having an output responsive to the

3       rate of change of the voltage across the common load, the control  
4       circuits also being responsive to the output of differentiator.

1       27. (Amended) The DC to DC converter of claim 26 wherein  
2       the time constant of the differentiator is adjustable by the  
3       selection of at least one component external to the integrated  
4       circuit.

1       28. (Amended) The DC to DC converter of claim 22 wherein  
2       the control circuits are also responsive to rapid decreases in  
3       the voltage across the common load to turn on the plurality of  
4       buck converter circuits independent of the phase of the plurality  
5       of pulse width modulators.

1       29. (Amended) The DC to DC converter of claim 28 wherein  
2       the control circuits are also responsive to rapid increases in  
3       the voltage across the common load to turn off the plurality of  
4       buck converter circuits independent of the phase of the plurality  
5       of pulse width modulators.

1       30. (Amended) The DC to DC converter of claim 22, wherein  
2       the plurality of pulse width modulators consist of a pair of  
3       pulse width modulators.

1       31. (Amended) The DC to DC converter of claim 22 wherein  
2       the feedback circuit is in the single integrated circuit.

1       32. (Three Times Amended) A DC to DC converter having a  
2       plurality of converter circuits operating into a common load,  
3       comprising:

4       a plurality of buck converter circuits operating into the  
5       common load, each buck converter circuit having an inductor for  
6       alternately conducting between the first power supply terminal  
7       and the common load, and the second power supply terminal and the  
8       common load;

9       a plurality of pulse width modulators each controlling one  
10      of the plurality of buck converter circuits, the operation of the  
11      pulse width modulators and the buck converter circuits being  
12      interleaved;

13      a feedback circuit responsive to a voltage across the common  
14      load;

15      control circuits responsive to the feedback circuit and a  
16      commanded output voltage to control a nominal duty cycle of the  
17      plurality of buck converter circuits, the control circuits also  
18      being responsive to the difference in currents in the plurality  
19      of interleaved buck converter circuits to adjust relative duty  
20      cycles of the plurality of buck converter circuits to balance the  
21      currents in the buck converter circuits;

22      the plurality of pulse width modulators and the control  
23      circuits being in a single integrated circuit.

1       34. (Twice Amended) The DC to DC converter of claim 32  
2       wherein the control circuits control the plurality of pulse width  
3       modulators.

1       35. (Amended) The DC to DC converter of claim 32 further  
2       comprising an integrator having an output responsive to the  
3       integral of an error signal, the error signal being responsive to  
4       the voltage across the common load and a desired voltage.

1       36. (Twice Amended) The DC to DC converter of claim 35,  
2       wherein the control circuits are also responsive to the output of  
3       the integrator.

1       37. (Amended) The DC to DC converter of claim 35 wherein a  
2       time constant of the integrator is adjustable by the selection of  
3       at least one component external to the integrated circuit.

1       38. (Amended) The DC to DC converter of claim 35 further  
2       comprising a differentiator having an output responsive to a rate  
3       of change of the voltage across the common load, the control  
4       circuits also being responsive to the output of differentiator.

1       39. (Amended) The DC to DC converter of claim 38 wherein a  
2       time constant of the differentiator is adjustable by the

3 selection of at least one component external to the integrated  
4 circuit.

1 40. (Amended) The DC to DC converter of claim 32 wherein  
2 the control circuits are also responsive to rapid decreases in  
3 the voltage across the common load to turn on the plurality of  
4 buck converter circuits, independent of the phase of the  
5 plurality of pulse width modulators.

1 41. (Amended) The DC to DC converter of claim 32 wherein  
2 the control circuits are also responsive to rapid increases in  
3 the voltage across the common load to turn off the plurality of  
4 buck converter circuits, independent of the phase of the  
5 plurality of pulse width modulators.

1 42. (Amended) The DC to DC converter of claim 32, wherein  
2 the plurality of pulse width modulators consist of a pair of  
3 pulse width modulators.

1 43. (Amended) The DC to DC converter of claim 32 wherein  
2 the commanded output voltage is controllable through an input to  
3 the integrated circuit.

1 44. (Amended) The DC to DC converter of claim 32 wherein  
2 the feedback circuit is in the single integrated circuit.

1       45. (Three Times Amended) A DC to DC converter having a  
2       plurality of converter circuits operating into a common load,  
3       comprising:

4       a plurality of buck converter circuits operating into the  
5       common load, each buck converter circuit having an inductor for  
6       alternately conducting between the first power supply terminal  
7       and the common load, and the second power supply terminal and the  
8       common load;

9       a plurality of pulse width modulators each controlling one  
10      of the plurality of buck converter circuits, the operation of the  
11      pulse width modulators being interleaved;

12      control circuits for adjusting a nominal duty cycle of the  
13      plurality of interleaved buck converter circuits, the control  
14      circuits also being responsive to the difference in currents in  
15      the plurality of interleaved buck converter circuits to adjust  
16      the relative duty cycles of the plurality of buck converter  
17      circuits to balance the currents therein;

18      the plurality of pulse width modulators and the control  
19      circuits being in a single integrated circuit.

1       46. (Twice Amended) A DC to DC converter having first and  
2       second converter circuits operating into a common load,  
3       comprising:

4       first and second buck converter circuits operating into the  
5   common load, each buck converter circuit having an inductor for  
6   alternately conducting between the first power supply terminal  
7   and the common load, and the second power supply terminal and the  
8   common load;

9       a first pulse width modulator controlling the first buck  
10   converter circuit;

11       a second pulse width modulator controlling the second buck  
12   converter circuit;

13       a feedback circuit responsive to the voltage across the  
14   common load;

15       control circuits for controlling the first and second pulse  
16   width modulators responsive to the feedback circuit;

17       the control circuits also being responsive to current  
18   measurements in the first buck converter circuit and the second  
19   buck converter circuit for adjusting the relative duty cycle of  
20   the first and second pulse width modulators to balance the  
21   currents in the buck converter circuits;

22       the first pulse width modulator, the second pulse width  
23   modulator, the feedback circuit and the control circuits being in  
24   a single integrated circuit.

1       47. (Twice Amended) A DC to DC converter having a  
2   plurality of converter circuits operating into a common load,  
3   comprising:

4        a plurality of buck converter circuits operating into the  
5    common load, each buck converter circuit having an inductor for  
6    alternately conducting between the first power supply terminal  
7    and the common load, and the second power supply terminal and the  
8    common load;

9        a plurality of pulse width modulators driven by a common  
10   oscillator in an interleaved manner, each pulse width modulator  
11   controlling one of the plurality of buck converter circuits,  
12   whereby the operation of the buck converter circuits is  
13   interleaved;

14        a feedback circuit responsive to a voltage across the common  
15   load;

16        a voltage control circuit for controlling the plurality of  
17   pulse width modulators responsive to the feedback circuit and a  
18   commanded output voltage; and

19        a current balance control circuit responsive to the  
20   difference in currents in the plurality of interleaved buck  
21   converter circuits for controlling the pulse width modulators to  
22   balance the currents in the plurality of interleaved buck  
23   converter circuits;

24        the plurality of pulse width modulators, the feedback  
25   circuit, the voltage control circuit and the current balance  
26   control circuit being in a single integrated circuit.

1       48. (Twice Amended) A DC to DC converter having a  
2       plurality of converter circuits operating into a common load,  
3       comprising:

4       a plurality of buck converter circuits operating into the  
5       common load, each buck converter circuit having an inductor for  
6       alternately conducting between the first power supply terminal  
7       and the common load, and the second power supply terminal and the  
8       common load;

9       a plurality of pulse width modulators each controlling power  
10      switching devices of one of the plurality of interleaved buck  
11      converter circuits, the operation of the pulse width modulators  
12      and the buck converter circuits being interleaved;

13      a feedback circuit responsive to a voltage across the common  
14      load;

15      control circuits responsive to the feedback circuit and a  
16      commanded output voltage to control a nominal duty cycle of the  
17      plurality of buck converter circuits, the control circuits also  
18      being responsive to the difference in currents in the plurality  
19      of interleaved buck converter circuits to adjust the relative  
20      duty cycles of the plurality of buck converter circuits to  
21      balance the currents in the buck converter circuits;

22      the plurality of pulse width modulators, the feedback  
23      circuit and the control circuits being in a single integrated  
24      circuit.

1       49. (Twice Amended) A DC to DC converter having a  
2       plurality of converter circuits operating into a common load,  
3       comprising:

4       a plurality of buck converter circuits operating into the  
5       common load, each buck converter circuit having an inductor for  
6       alternately conducting between the first power supply terminal  
7       and the common load, and the second power supply terminal and the  
8       common load;

9       a plurality of pulse width modulators each controlling one  
10      of the plurality of buck converter circuits, the pulse width  
11      modulators being driven by a common oscillator signal so that the  
12      operation of the pulse width modulators is interleaved;

13      control circuits for adjusting a nominal duty cycle of the  
14      plurality of interleaved buck converter circuits to control a  
15      voltage on the common load, and for responding to the difference  
16      in currents in the plurality of interleaved buck converter  
17      circuits to adjust the relative duty cycles of the plurality of  
18      buck converter circuits to balance the currents in the buck  
19      converter circuits;

20      the plurality of pulse width modulators and the control  
21      circuits being in a single integrated circuit.

1       50. (Twice Amended) A DC to DC converter having first and  
2 second converter circuits operating into a common load,  
3 comprising:

4       first and second buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9       a first pulse width modulator controlling the first buck  
10 converter circuit;

11       a second pulse width modulator controlling the second buck  
12 converter circuit;

13       a feedback circuit responsive to the voltage across the  
14 common load;

15       control circuits for controlling the first and second pulse  
16 width modulators responsive to the feedback circuit;

17       the control circuits also being responsive to current  
18 measurements through the first buck converter circuit and the  
19 second buck converter circuit to adjust the relative duty cycle  
20 of the first and second buck converter circuits

21       the first pulse width modulator, the second pulse width  
22 modulator and the control circuits being in a single integrated  
23 circuit.

1        51. (Twice Amended) A DC to DC converter comprising:

2            a plurality of buck converter circuits operating into the

3        common load, each buck converter circuit having an inductor for

4        alternately conducting between the first power supply terminal

5        and the common load, and the second power supply terminal and the

6        common load;

7            a plurality of pulse width modulators driven by a common

8        oscillator in an interleaved manner, each pulse width modulator

9        controlling one of the plurality of buck converter circuits,

10       whereby the operation of the buck converter circuits is

11       interleaved;

12            a feedback circuit responsive to a voltage on the common

13        output;

14            a voltage control circuit for controlling the plurality of

15        pulse width modulators responsive to the feedback circuit and a

16        commanded output voltage; and

17            a current balance control circuit for controlling the pulse

18        width modulators responsive to a difference in currents in the

19        inductors of the plurality of interleaved buck converter circuits

20        to balance the currents in the plurality of interleaved buck

21        converter circuits;

22            the plurality of pulse width modulators and the control

23        circuits being in a single integrated circuit.

1       52. (Twice Amended) A DC to DC converter having a  
2       plurality of converter circuits operating into a common load,  
3       comprising:

4       a plurality of buck converter circuits operating into the  
5       common load, each buck converter circuit having an inductor for  
6       alternately conducting between the first power supply terminal  
7       and the common load, and the second power supply terminal and the  
8       common load;

9       a plurality of pulse width modulators each controlling power  
10      switching devices of one of the plurality of buck converter  
11      circuits, the operation of the pulse width modulators and the  
12      buck converter circuits being interleaved;

13      a feedback circuit responsive to a voltage across the common  
14      load;

15      control circuits being responsive to the feedback circuit  
16      and a commanded output voltage to control a nominal duty cycle of  
17      the plurality of buck converter circuits, the control circuits  
18      also being responsive to the difference in currents in the  
19      plurality of interleaved buck converter circuits to adjust the  
20      relative duty cycles of the plurality of buck converter circuits  
21      to balance the currents in the buck converter circuits;

22      the plurality of pulse width modulators and the control  
23      circuits being in a single integrated circuit.

1       53. (Twice Amended) A DC to DC converter having first and  
2 second converter circuits operating into a common load,  
3 comprising:

4       first and second buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9       a first pulse width modulator controlling the first buck  
10 converter circuit;

11       a second pulse width modulator controlling the second buck  
12 converter circuit;

13       a feedback circuit responsive to the voltage across the  
14 common load;

15       control circuits for controlling the first and second pulse  
16 width modulators responsive to the feedback circuit;

17       the control circuits also being responsive to current  
18 measurements in the first buck converter circuit and the second  
19 buck converter circuit to adjust the relative duty cycle of the  
20 first and second buck converter circuits;

21       the first pulse width modulator, the second pulse width  
22 modulator, the feedback circuit and the control circuits being in  
23 a single integrated circuit.

1       54. (Twice Amended) A DC to DC converter having a  
2       plurality of converter circuits operating into a common load,  
3       comprising:

4       a plurality of buck converter circuits operating into the  
5       common load, each buck converter circuit having an inductor for  
6       alternately conducting between the first power supply terminal  
7       and the common load, and the second power supply terminal and the  
8       common load;

9       a plurality of pulse width modulators driven by a common  
10      oscillator in an interleaved manner, each pulse width modulator  
11      controlling one of the plurality of buck converter circuits,  
12      whereby the operation of the buck converter circuits is  
13      interleaved;

14      a feedback circuit responsive to a voltage across the common  
15      load;

16      a voltage control circuit for controlling the plurality of  
17      pulse width modulators responsive to the feedback circuit and a  
18      commanded output voltage; and

19      a current balance control circuit for controlling the pulse  
20      width modulators to balance the currents in the plurality of  
21      interleaved buck converter circuits responsive to the difference  
22      in currents in the plurality of interleaved buck converter  
23      circuits;

24        the plurality of pulse width modulators, the voltage control  
25    circuit and the current balance control circuit being in a single  
26    integrated circuit.

1        55. (Twice Amended) A DC to DC converter having a  
2    plurality of converter circuits operating into a common load,  
3    comprising:

4        a plurality of buck converter circuits operating into the  
5    common load, each buck converter circuit having an inductor for  
6    alternately conducting between the first power supply terminal  
7    and the common load, and the second power supply terminal and the  
8    common load;

9        a plurality of pulse width modulators each controlling power  
10   switching devices of one of the plurality of interleaved buck  
11   converter circuits, the operation of the pulse width modulators  
12   and the buck converter circuits being interleaved;

13        a feedback circuit responsive to a voltage across the common  
14   load;

15        control circuits responsive to the feedback circuit and a  
16   commanded output voltage to control a nominal duty cycle of the  
17   plurality of buck converter circuits, the control circuits also  
18   adjusting relative duty cycles of the plurality of buck converter  
19   circuits to balance the currents in the buck converter circuits  
20   responsive to the difference in currents in the plurality of  
21   interleaved buck converter circuits;

22           the plurality of pulse width modulators and the control  
23   circuits being in a single integrated circuit.

1           56. (Twice Amended) A DC to DC converter having a  
2   plurality of converter circuits operating into a common load,  
3   comprising:

4           a plurality of buck converter circuits operating into the  
5   common load, each buck converter circuit having an inductor for  
6   alternately conducting between the first power supply terminal  
7   and the common load, and the second power supply terminal and the  
8   common load;

9           a plurality of pulse width modulators each controlling one  
10   of the plurality of buck converter circuits, the pulse width  
11   modulators being driven by a common oscillator signal so that the  
12   operation of the pulse width modulators is interleaved;

13           control circuits for adjusting a nominal duty cycle of the  
14   plurality of interleaved buck converter circuits to control a  
15   voltage on the common load, and for adjusting relative duty  
16   cycles of the plurality of buck converter circuits to balance the  
17   currents in the buck converter circuits;

18           the plurality of pulse width modulators and the control  
19   circuits being in a single integrated circuit.

1        57. (Twice Amended) A DC to DC converter having first and  
2 second buck converter circuits operating into a common load,  
3 comprising:

4        first and second buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a first pulse width modulator controlling the first buck  
10 converter circuit;

11        a second pulse width modulator controlling the second buck  
12 converter circuit;

13        a feedback circuit responsive to the voltage across the  
14 common load;

15        control circuits for controlling the first and second pulse  
16 width modulators responsive to the feedback circuit;

17        the control circuits also being responsive to current  
18 measurements in the first buck converter circuit and the second  
19 buck converter circuit to adjust the relative duty cycle of the  
20 first and second pulse width modulators to balance the currents  
21 in the buck converter circuits;

22        the first pulse width modulator, the second pulse width  
23 modulator and the control circuits being in a single integrated  
24 circuit.

1        58. (Amended) A DC to DC converter having a plurality of  
2 converter circuits for operating into a common load, comprising:  
3            a plurality of buck converter circuits operating into the  
4 common load, each buck converter circuit having an inductor for  
5 alternately conducting between the first power supply terminal  
6 and the common load, and the second power supply terminal and the  
7 common load;  
8            a plurality of pulse width modulators driven by a common  
9 oscillator in an interleaved manner, each pulse width modulator  
10 controlling one of the plurality of buck converter circuits,  
11 whereby the operation of the buck converter circuits is  
12 interleaved;  
13            a feedback circuit responsive to a voltage across the common  
14 output;  
15            a voltage control circuit controlling the plurality of pulse  
16 width modulators responsive to the feedback circuit and a  
17 commanded output voltage;  
18            the plurality of pulse width modulators and the control  
19 circuits being in a single integrated circuit.

1        59. The DC to DC converter of claim 58 further comprising  
2 the common oscillator, the common oscillator also being in the  
3 single integrated circuit.

1        60. (Amended) A DC to DC converter having a plurality of  
2 converter circuits operating into a common load, comprising:  
3            a plurality of buck converter circuits operating into the  
4 common load, each buck converter circuit having an inductor for  
5 alternately conducting between the first power supply terminal  
6 and the common load, and the second power supply terminal and the  
7 common load;  
8            a plurality of pulse width modulators each controlling one  
9 of the plurality of buck converter circuits, the operation of the  
10 pulse width modulators and the buck converter circuits being  
11 interleaved;  
12            a feedback circuit responsive to a voltage across the common  
13 load;  
14            control circuits responsive to the feedback circuit and a  
15 commanded output voltage to control a nominal duty cycle of the  
16 plurality of buck converter circuits;  
17            the plurality of pulse width modulators and the control  
18 circuits being in a single integrated circuit.

1        61. The DC to DC converter of claim 60 further comprising  
2 the common oscillator, the common oscillator also being in the  
3 single integrated circuit.

1       62. (Amended) A DC to DC converter comprising:

2       first and second buck converter circuits operating into a  
3       common load, each buck converter circuit having an inductor for  
4       alternately conducting between the first power supply terminal  
5       and the common load, and the second power supply terminal and the  
6       common load;

7       first and second pulse width modulators driven by a common  
8       oscillator in an interleaved manner, each pulse width modulator  
9       controlling a respective one of the first and second buck  
10      converter circuits, whereby the operation of the buck converter  
11      circuits is interleaved;

12      a feedback circuit responsive to a voltage across the common  
13      output;

14      a voltage control circuit controlling the first and second  
15      pulse width modulators responsive to the feedback circuit and a  
16      commanded output voltage;

17      the plurality of pulse width modulators and the control  
18      circuits being in a single integrated circuit.

1       63. The DC to DC converter of claim 62 further comprising  
2       the common oscillator, the common oscillator also being in the  
3       single integrated circuit.

1        64. (Amended) A DC to DC converter comprising:

2            first and second buck converter circuits operating into a

3        common load, each buck converter circuit having an inductor for

4        alternately conducting between the first power supply terminal

5        and the common load, and the second power supply terminal and the

6        common load;

7            first and second pulse width modulators each controlling a

8        respective one of the buck converter circuits, the operation of

9        the pulse width modulators and the buck converter circuits being

10       interleaved;

11           a feedback circuit responsive to a voltage across the common

12       load;

13           control circuits responsive to the feedback circuit and a

14       commanded output voltage to control a nominal duty cycle of the

15       plurality of buck converter circuits;

16           the plurality of pulse width modulators and the control

17       circuits being in a single integrated circuit.

1        65. The DC to DC converter of claim 64 further comprising

2        the common oscillator, the common oscillator also being in the

3        single integrated circuit.